North Carolina Department of Transportation
Statewide Planning Branch
Small Urban Planning Unit

THOROUGHFARE PLAN FOR LAKE LURE

AND

TRANSPORTATION STATUS REPORT

FOR

CHIMNEY ROCK

1993

THOROUGHFARE PLAN
FOR
LAKE LURE, NORTH CAROLINA

and

TRANSPORTATION STATUS REPORT
FOR
CHIMNEY ROCK, NORTH CAROLINA

Prepared by the:

Statewide Planning Branch
Division of Highways
N.C. Department of Transportation

In cooperation with:

The Town of Lake Lure
The Town of Chimney Rock
The Federal Highway Administration
U.S. Department of Transportation

March 4, 1993

David G. Modlin, Jr., Ph. D., P.E.
Small Urban Planning Unit Head

EXECUTIVE SUMMARY

After a December 3, 1991 meeting with a Statewide Planning Branch representative, the Towns of Lake Lure and Chimney Rock requested that they have a thoroughfare plan. Due to their relative proximity, it was decided to perform one study combining both Towns.

On January 14, 1992 Statewide Planning representatives held a meeting with the Planning Boards of both Lake Lure and Chimney Rock to discuss the planning process and receive input from members of both Planning Boards. Members attending this meeting stated that the most critical traffic problems were congestion at the Lake's beach and in the center of Chimney Rock. These problems occur during the tourist season (May through July and weekends and holidays in October). It was also stated that emergency vehicles could not travel from one end of the planning area to the other quickly enough. This is due to the lack of alternate routes around the Lake.

Merchants from Chimney Rock expressed that solutions to traffic problems in their Town would not be acceptable if they included the removal of parking spaces from the storefronts.

In May of 1992, preliminary recommendations were made to the Lake Lure/Chimney Rock Thoroughfare Plan Committee (consists of members of both Planning Boards). This committee wanted to first look at short term traffic engineering solutions before committing to a thoroughfare plan. Statewide Planning contacted the Municipal Traffic Engineering Assistance Unit of Traffic Engineering and provided them with information/data regarding the Lake Lure /Chimney Rock area.

There are two recommended improvements to the road network that are considered to be feasible in the scope of a Thoroughfare Plan. Both improvements are located within the Lake Lure City limits. This report serves to document the recommendations in Lake Lure and to provide a status report of transportation conditions in Chimney Rock.

30 copies of this document were printed at a cost of $100.98 or $3.37 per copy. {GS 143-170.1}

TABLE OF CONTENTS

APPENDICES

LIST OF TABLES

TABLE

LIST OF FIGURES

FIGURE

I. INTRODUCTION

The economic growth of a region is largely dependant on how efficiently the transportation system handles travel demands. A thoroughfare plan is an essential tool that is used to accommodate these demands and encourage future growth. The plan accomplishes this goal by proposing new roads and improvements to existing roads. These proposals are based on land use and traffic projections through the design year.

The purpose of this report is to present recommended improvements to the existing road network in Lake Lure and to suggest possible courses of action to address congestion and parking problems in Chimney Rock. The major improvements are all within the Lake Lure city limits. However, because Lake Lure and Chimney Rock are located immediately adjacent to one another, they cannot be studied separately on a thoroughfare planning level of study.

The original intention of this study was to alleviate traffic problems in the Towns of Lake Lure and Chimney Rock. However, feasible improvements inside the Chimney Rock city limits were eliminated during discussions between Statewide Planning and the Lake Lure/Chimney Rock Joint Transportation Committee. The improvements were eliminated due to the geographic constraints and potential negative impacts to businesses in Chimney Rock. Consequently, this report only proposes improvements to roads inside the Lake Lure city limits. In Chimney Rock, the study identifies possible sites for parking lots and discusses the current and projected traffic conditions.

Lake Lure and Chimney Rock are located in Rutherford County in the western Piedmont region of North Carolina. They are both small villages along the Broad River in the Hickory Nut Gorge. This area is unique in that it is solely reliant on tourism for its economy. Travelers come to these villages along US 64-74 and NC 9.

In 1922 Dr. Lucius B. Morse organized a company to develop the Hickory Nut Gorge area into an alpine-type resort. In 1925 a dam was built across the gorge, creating Lake Lure. The Lake has a surface area of 1500 acres and has a 27 mile shoreline. The shoreline boasts a golf course, hotels, and numerous summer cottages. Lake Lure attracts boaters, water skiers, swimmers, and fishermen.

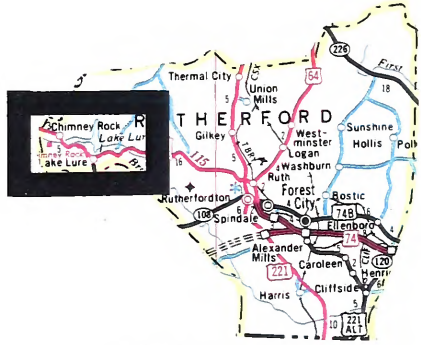
Chimney Rock is a village along US 64-74 just west of Lake Lure. The village consists of shops, motels, and cafes which serve the tourists coming to see the Chimney Rock. The Chimney itself is a 300 foot tall granite monolith which jutts out from Chimney Rock Mountain. It has an elevator

inside it that takes tourists to the top for a spectacular view of Lake Lure and the surrounding country.

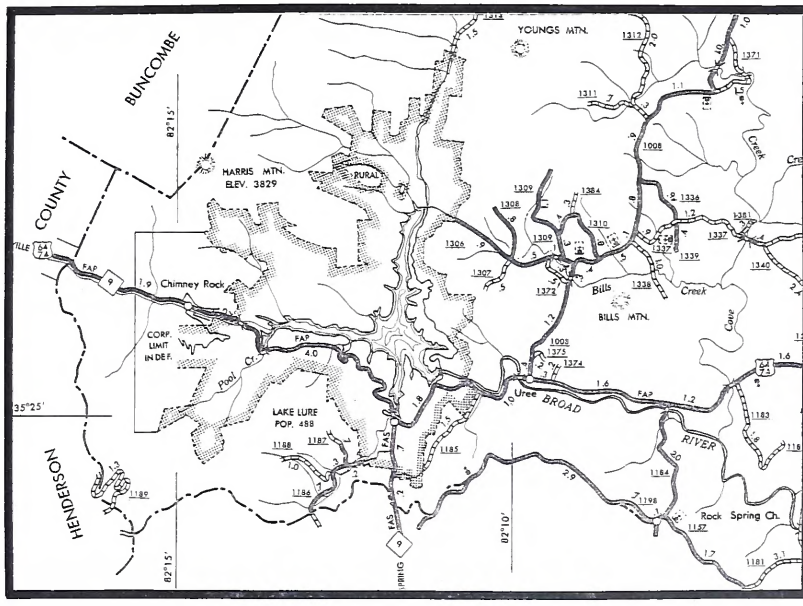
It should be emphasized that the proposed thoroughfare plan is based on the anticipated growth of the Towns of Lake Lure, Chimney Rock and their surrounding areas as described in this report. It is possible that the actual growth patterns differ somewhat from those logically anticipated. As a result, it may be necessary to accelerate or retard the implementation of some portions of the plan and/or make revisions which will accommodate unexpected changes in urban development.

GEOGRAPHIC LOCATION

NORTH CAROLINA



RUTHERFORD COUNTY



CHIMNEY ROCK LAKE LURE

FIGURE 1

II. THOROUGHFARE PLANNING PRINCIPLES

Objectives

Typically, the urban street system occupies 25 to 30 percent of the total developed land in an urban area. Since the system is permanent and expensive to build and maintain, care and foresight are needed in its development. Thoroughfare planning is the process public officials use to assure the development of the most appropriate street system to meet the existing and future travel desires within the urban area.

The primary aim of a thoroughfare plan is to guide the development of the urban street system in a manner consistent with changing traffic demands. Through proper planning for street development, costly errors and needless expense can be averted. A thoroughfare plan will enable street improvements to be made as traffic demands increase, and help eliminate unnecessary improvements. By developing the urban street system to keep pace with increasing traffic demands, a maximum utilization of the system can be attained that will require a minimum amount of land for street purposes. In addition to providing for traffic needs, the thoroughfare plan should embody those details of good urban planning necessary to present a pleasing and efficient urban community. The location of present and future population, commercial enterprises, and industry affects major street and highway locations. Conversely, the location of major streets and highways within the urban area will influence the urban development pattern.

Other objectives of a thoroughfare plan include:

(1) To provide for the orderly development of an adequate major street system as land development occurs;

(2) To reduce travel and transportation costs;

(3) To reduce the cost of major street improvements to the public through the coordination of a street system with private action;

(4) To enable private interests to plan their actions, improvements, and development with full knowledge of public intent;

(5) To minimize disruption and displacement of people and businesses through long range advance planning for major street improvements;

(6) To reduce environmental impacts such as air pollution, resulting from transportation; and

(7) To increase travel safety.

Thoroughfare planning objectives are achieved through both: (1) improving the operational efficiency of thoroughfares; and (2) improving the system efficiency through system coordination and layout.

Operational Efficiency

A street's operational efficiency is improved by increasing the capability of the street to carry vehicular traffic and people. In terms of vehicular traffic, a street's capacity is defined as the maximum number of vehicles which can pass a given point on a roadway during a given time period under prevailing roadway and traffic conditions. Capacity is affected by the physical features of the roadway, nature of traffic, and weather.

Physical ways to improve vehicular capacity include **street widening, intersection improvements, improving vertical** and **horizontal alignment,** and **eliminating roadside obstacles.** For example, widening of a street from two to four travel lanes more than doubles the capacity of the street by providing additional maneuverability for traffic. Impedances to traffic flow caused by slow moving or turning vehicles and adverse effects of horizontal and vertical alignments are thus reduced.

Operational ways to improve street capacity include:

(1) **Control of access** - A roadway with complete access control can often carry three times the traffic handled by a non-controlled access street with identical lane widths and number of lanes.

(2) **Parking removal** - Increases capacity by providing additional street width for traffic flow and reducing friction to flow caused by parking and unparking vehicles.

(3) **One-way operation** - The capacity of a street can sometimes be increased 20-50%, depending upon turning movements and overall street width, by initiating one-way traffic operations. One-way streets can also improve traffic flow by decreasing potential traffic conflicts and simplifying traffic signal coordination.

(4) **Reversible lanes** - Reversible traffic lanes may be used to increase street capacity in situations where heavy directional flows occur during peak periods.

(5) **Signal phasing and coordination** - Uncoordinated signals and poor signal phasing restrict traffic flow by creating excessive stop-and-go operation.

Altering travel demand is a third way to improve the efficiency of existing streets. Travel demand can be reduced or altered in the following ways:

(1) Encourage people to form **carpools** and **vanpools** for journeys to work and other trip purposes. This reduces the number of vehicles on the roadway and raises the people carrying capability of the street system.

(2) Encourage the use of alternate modes of travel such as **transit** and **bicycles.**

(3) Encourage industries, business, and institutions to **stagger work hours** or establish variable work hours for employees. This will reduce travel demand in peak periods and spread peak travel over a longer time period.

(4) Plan and encourage **land use development** or redevelopment in a more travel efficient manner.

System Efficiency

Another means of altering travel demand is the development of a more efficient system of streets that will better serve travel desires. A more efficient system can reduce travel distances, time, and cost. Improvements in system efficiency can be achieved through the concept of functional classification of streets and development of a coordinated major street system.

Functional Classification

Streets perform two primary functions -- traffic service and land access -- which when combined, are basically incompatible. The conflict is not serious if both traffic and land service demands are low. However, when traffic volumes are high, conflicts created by uncontrolled and intensely used abutting property lead to intolerable traffic flow friction and congestion.

The underlying concept of the thoroughfare plan is that it provides a functional system of streets which permits travel from origins to destinations with directness, ease and safety. Different streets in this system are designed and called on to perform specific functions, thus minimizing the traffic and land service conflict. Streets are categorized as to whether they function as local access streets, minor thoroughfares or major thoroughfares (**see Figure 2**).

Local access streets provide access to abutting property. They are not intended to carry heavy volumes of traffic and should be located such that only traffic with origins and destinations on the streets would be served. Local streets may be further classified as either residential, commercial and/or industrial depending upon the type of land use which they serve.

Minor thoroughfares are more important streets in the city system. They collect traffic form local access streets and carry it to the major thoroughfare system. They may in some instances supplement the major thoroughfare system by facilitating minor through traffic movements. A third function which may be performed is that of providing access to abutting property. They should be designed to serve limited areas so that their development as major thoroughfares will be prevented.

Major thoroughfares are the primary traffic arteries of the city. Their function is to move intra-city and inter-city traffic. The streets which comprise the major thoroughfare system may also serve abutting property; however, THEIR MAJOR FUNCTION IS TO CARRY TRAFFIC. They should not be bordered by uncontrolled strip development because such development significantly lowers the capacity of the thoroughfare to carry traffic and each driveway is a danger and an impediment to traffic flow. Major thoroughfares may range from a two-lane street carrying minor traffic volumes to major expressways with four or more traffic lanes. Parking normally should not be permitted on major thoroughfares.

Idealized Major Thoroughfare System

A coordinated system of major thoroughfares forms the basic framework of the urban street system. A major thoroughfare system which is most adaptable to desire lines of travel within an urban area and which permits movement between various areas of the city with maximum directness is the radial-loop system. This system consists of several functional elements-radial streets, crosstown streets, loop system streets, and bypasses **(Figure 2)**.

Radial streets provide for traffic movement between points located in the outskirts of the city and the central area. This is a major traffic movement in most cities, and the economic strength of the central business district depends upon the adequacy of this type of thoroughfare.

IDEALIZED THOROUGHFARE PLAN

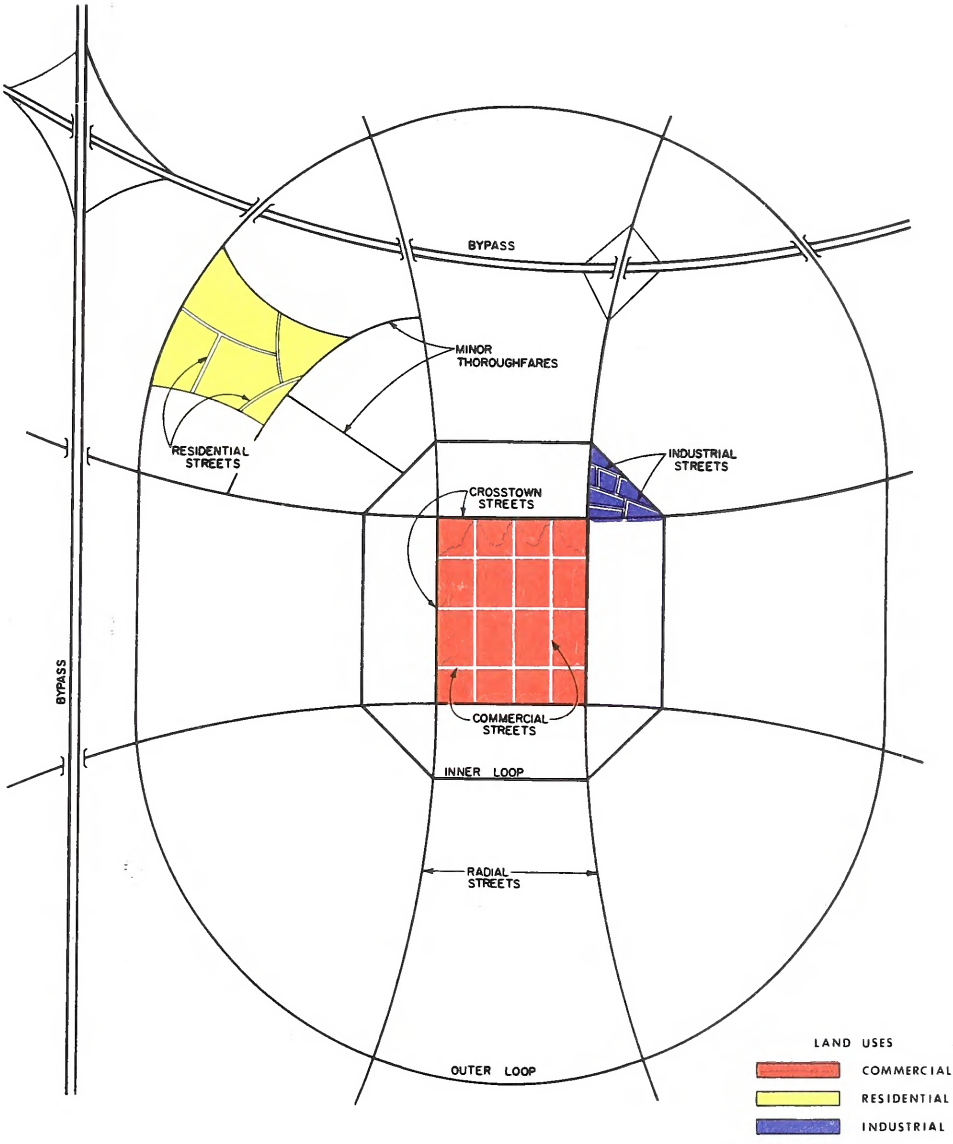


FIGURE 2

If all radial streets crossed in the central area, an intolerable congestion problem would result. To avoid this problem, it is very important to have a system of **crosstown streets** which form a loop around the central business district. This system allows traffic moving from origins on one side of the central area to destinations on the other to follow the area's border and allows central area traffic to circle and then enter the area near a given destination. The effect of a good crosstown system is to free the central area of crosstown traffic, thus permitting the central area to function more adequately in its role as a pedestrian shopping area.

Loop system streets move traffic between suburban areas of the city. Although a loop may completely encircle the city, a typical trip may be from an origin near a radial thoroughfare to a destination near another radial thoroughfare. Loop streets do not necessarily carry heavy volumes of traffic, but they function to relieve central areas. There may be one or more loops, depending on the size of the urban area, and they are generally spaced one-half mile to one mile apart, depending on the intensity of the land use.

A **bypass** is designed to carry traffic through or around the urban area, thus providing relief to the city street system by removing from it traffic which has no desire to be in the city. Bypasses are usually designed to through highway standards, with control of access. Occasionally, a bypass with low traffic volume can be designed to function as a portion of an urban loop. The general effect of bypasses is to expedite the movement of through traffic and to improve traffic conditions within the city. By freeing the local streets for use by shopping and home-to-work traffic, bypasses tend to increase the economic vitality of the local area.

Application of Thoroughfare Planning Principles

The concepts presented in the discussion of operational efficiency, system efficiency, functional classification, and idealized major thoroughfare system are the conceptual tools available to the transportation planner in developing a thoroughfare plan. In actual practice, thoroughfare planning is done for established urban areas and is constrained by existing land use and street patterns, existing public attitudes and goals, and current expectations of future land use. Compromises must be made because of these and the many other factors that affect major street locations.

Throughout the thoroughfare planning process it is necessary from a practical viewpoint that certain basic principles be followed as closely as possible. These principles are as follows:

(1) The plan should be derived from a thorough knowledge of today's travel - its component parts, as well as the factors that contribute to it, limit it, and modify it.

(2) Traffic demands must be sufficient to warrant the designation and development of each major street. The thoroughfare plan should be designed to accommodate a large portion of all major traffic movements on a relatively few streets.

(3) The plan should conform to and provide for the land development plan of the area.

(4) Certain considerations must be given to urban development beyond the current planning period. Particularly in outlying or sparsely developed areas which have development potential, it is necessary to designate thoroughfares on a long-range planning basis to protect rights-of-way for future thoroughfare development.

(5) While being consistent with the above principles and realistic in terms of travel trends, the plan must be economically feasible.

III. EXISTING AND PROJECTED CONDITIONS

Economy and Employment

The economies of Lake Lure and Chimney Rock are atypical for a thoroughfare planning area in that there is no significant industry. Lake Lure is composed of resort homes which are occupied seasonally and year-round homes which are primarily owned by retirees. The tax rate is unusually low and the only significant generators of income for the Town are the public beach and the hydroelectric dam. The beach charges an entrance fee and the electricity generated by the dam is sold to the power company.

The Town of Chimney Rock completely relies on the tourist season for its economy. Most of the permanent residents of Chimney Rock are employed in the shops or hotels along US 64-74. To these residents, the provision of parking for their businesses is as important as an efficient means of travel through the Town.

Factors Affecting Transportation

Thoroughfare planning is a process whose objective is to develop a transportation system which will enable people and goods to travel safely and economically. To determine the needs of an area its population, land use, and traffic must be examined. To make these determinations, it is important to understand and describe the type and volume of travel which takes place in the area, and also to clearly identify the goals and objectives to be met by the transportation plan.

In order to fulfill the objectives of an adequate twenty-year thoroughfare plan, reliable forecasts of future travel patterns must be achieved. Such forecasts are possible only when the following major items are carefully analyzed: **(1)** historic and potential population changes; **(2)** significant trends in the economy; and **(3)** character and intensity of land development. Additional items that vary in influence include the effects of legal controls such as zoning ordinances and subdivision regulations, availability of public utilities and transportation facilities, and topographic and other physical features of the urban area.

Population and Seasonal Trends

In most areas travel is directly related to population, hence, the volume of traffic on any road is a direct result of the size and distribution of the area's population. However, in the Lake Lure/Chimney Rock area the heavy tourist season must also be taken into account. The permanent resident segment of the population has grown at a steady, predictable rate but the area's population explodes temporarily during the tourist season. The peak months

according to permanent traffic recorders are April, June, July, and October. **Table 1** shows the past and projected population figures for the planning area.

TABLE 1
POPULATION TRENDS & PROJECTIONS*

	1970	1980	1990	%GROWTH	2020
Rutherford County	47,337	53,787	58,396	1.06	80,012
Chimney Rock Township	1,094	1,457	1,700	2.23	3,293
Lake Lure Town	456	488	691	2.10	1,289
Planning Area	766	1,020	1,190	2.23	2,305

* Obtained from census data

Traffic Accidents

Accident records for October 1988 through September 1991 were studied for the Lake Lure/Chimney Rock planning area. As would be expected the majority of the accidents occurred at the intersection of US 64-74 and NC 9 and during weekends in the summer. However, the number of accidents was not significant at any one location within the planning area.

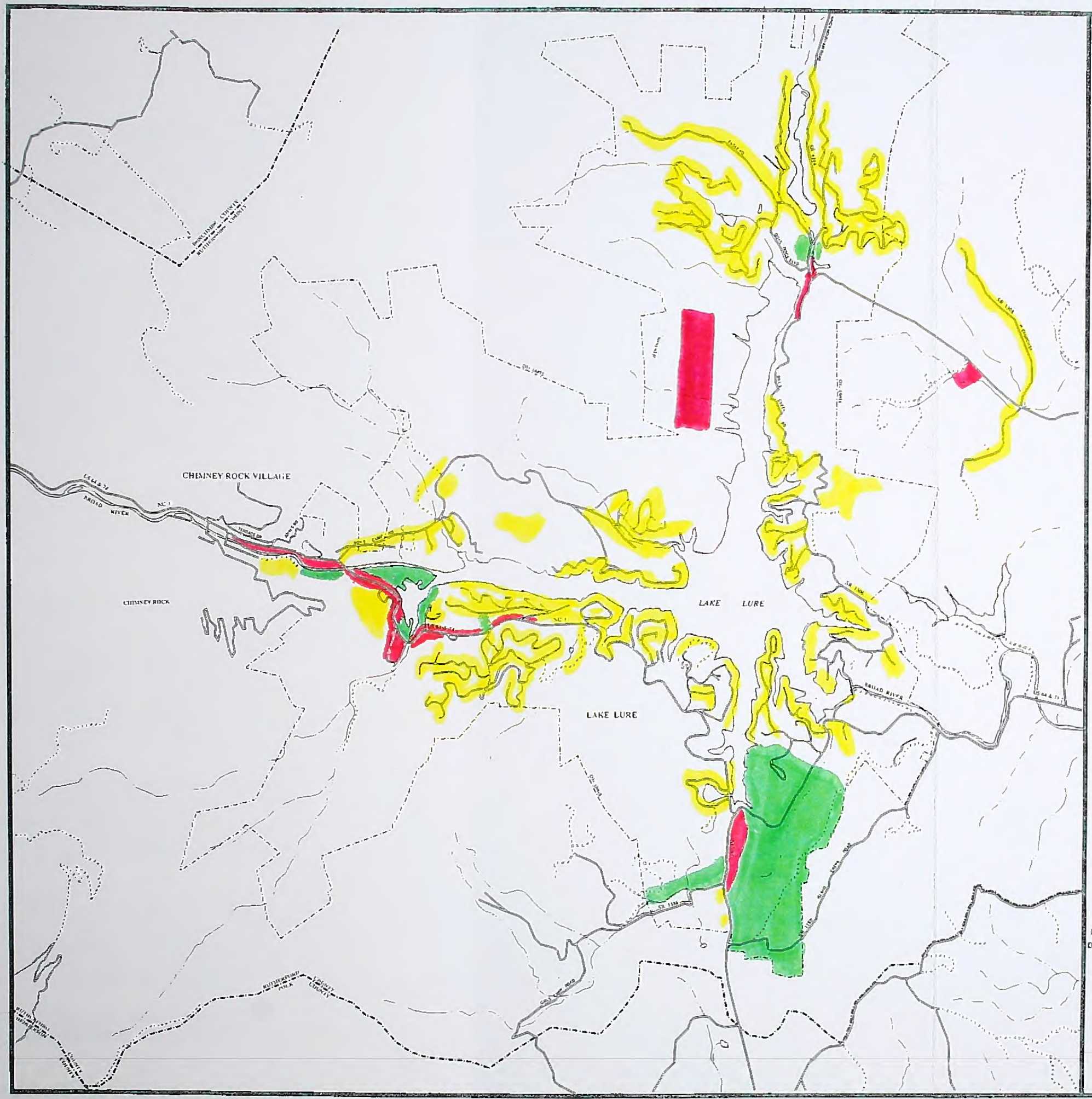
Land Use

The generation of traffic on a particular street is closely related to the adjacent land use. Attraction between different land uses varies with the intensity and spatial separation of the uses. For the purpose of transportation planning, it is necessary to designate land use by type. An analysis of the distribution of existing land uses serves as a basis for forecasting future land use needs and the resulting travel patterns.

For thoroughfare planning purposes, the land uses are grouped into four broad categories: **(1) Residential** - all land devoted to the housing of people; **(2) Commercial** -all land devoted to retail trade, including consumer and business services and offices; **(3) Industrial** - all land devoted to manufacturing, storage, warehousing, and transportation of products; and **(4) Public** - all land devoted to social, religious, educational, cultural, and political activities.

The Lake Lure/Chimney Rock planning area's land use is shown in **Figure 3**.

FIGURE 3
LAND USE



RESIDENTIAL
PUBLIC
COMMERCIAL
INDUSTRIAL

LAKE LURE
AND
CHIMNEY ROCK VILLAGE
RUTHERFORD COUNTY
NORTH CAROLINA

PREPARED BY THE
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS-STATEWIDE PLANNING BRANCH
IN COOPERATION WITH
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

SCALE IN FEET

JANUARY 1992

IV. SYSTEM DEFICIENCIES

Deficiencies in a road system are evidenced by poor levels of service, high accident locations, and, in general, a difficulty in traveling from an origin to a particular destination. Inadequate lane width, obsolete and deficient bridges, poor intersection geometry, and indirect routes between important points are all contributing factors to system deficiencies.

The most evident deficiency in the Lake Lure/Chimney Rock street network is the congestion along US 64-74/NC 9 through the center of both Towns. This congestion occurs during the tourist season and is primarily a result of high volumes of slow moving traffic searching for parking spaces and sightseeing. Two factors that compound this problem are **1)** automobiles entering and exiting the inconveniently located parking spaces and **2)** large numbers of pedestrians walking from shop to shop in Chimney Rock or between shops and the beach in Lake Lure. The parking problems are discussed in Chapter V.

Any future growth will simply make matters worse. Therefore, a system is needed that will efficiently accommodate the parking demand and provide a safe means of travel for through traffic.

Capacity Analysis

Capacity is defined as the maximum number of vehicles, under prevailing roadway and traffic conditions, that have a reasonable expectation of passing over a given roadway section in one or both directions during a given time period. A comparison of capacity with actual traffic volumes is a good indicator of the adequacy of the existing major street network.

An analysis of roads in the planning area was made to determine if the projected traffic (year 2020) would exceed the practical capacity of the system. Based on this analysis, it was determined that capacity problems would continue to occur only during the tourist season as they do at present.

In an urban area, a street's ability to move traffic is generally controlled by the spacing of major intersections, the pavement width, and the type and number of traffic control devices. These characteristics can be manipulated to increase the capacity and improve the level of service.

The level of service is a function of the ease of movement experienced by motorists using the facility. Six

levels of service, shown in **Figure 4**, have been selected to identify the conditions existing under various speed and volume conditions on any highway or street.

The six levels of service are:

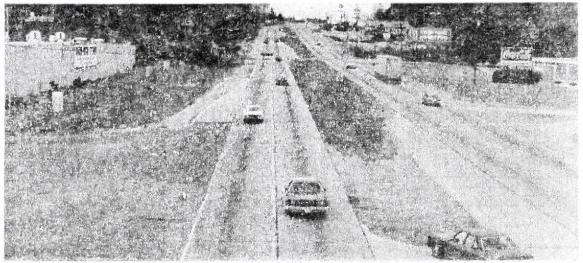
1. **Level of service A** - A condition of free flow with low traffic volumes and high speeds. Individual users are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to maneuver within the traffic stream is extremely high. The general level of comfort and convenience provided to the motorist, passenger, or pedestrian is excellent.

2. **Level of service B** - A zone of stable flow, where the presence of other users in the traffic stream begins to be noticeable. Freedom to select desired speeds is relatively unaffected, but there is a slight decline in the freedom to maneuver within the traffic stream from LOS A, because the presence of others in the traffic stream begins to affect individual behavior.

3. **Level of service C** - Also in the range of stable flow, but the operation of individual users becomes significantly affected by interactions with others in the traffic stream. The selection of speed is now affected by the presence of others, and maneuvering within the traffic stream requires substantial vigilance on the part of the user. The general level of comfort and convenience declines noticeably at this level.

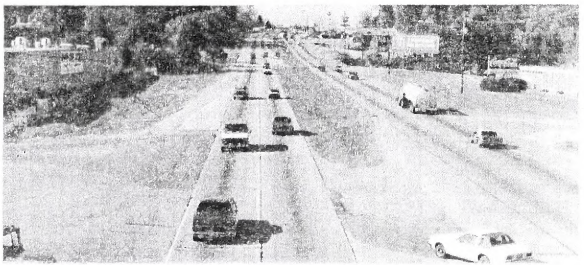
4. **Level of service D** - Approaches unstable flow, where speed and freedom to maneuver are severely restricted. The driver or pedestrian experiences a generally poor level of comfort and convenience. Small increases in traffic flow will generally cause operational problems at this level.

5. **Level of service E** - Represents operating conditions at or near the capacity level. All speeds are reduced to a low, but relatively uniform value. Maneuver within the traffic stream is extremely difficult, and it is generally accomplished by forcing a vehicle or pedestrian to "give way" to accommodate such maneuvers. Comfort and convenience levels are extremely poor. Driver and pedestrian frustration is generally high. Operations at this level are usually unstable, because small increases in flow or minor perturbations within the traffic stream will cause breakdowns.



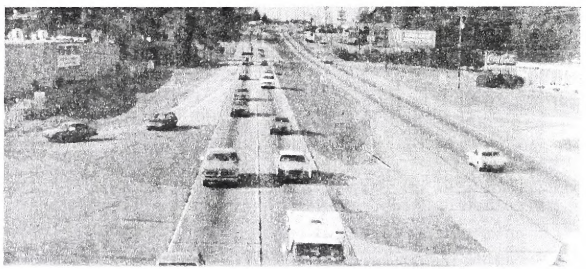
LEVEL OF SERVICE - A

LEVEL OF SERVICE - D



LEVEL OF SERVICE - B

LEVEL OF SERVICE - E



LEVEL OF SERVICE - C

LEVEL OF SERVICE - F

LEVELS OF SERVICE

FIGURE 4

6. **Level of service F** - Forced flow operations at low speeds, where volumes are below capacity. This condition exists wherever the amount of traffic approaching a point exceeds the amount which can traverse the point. Queues form behind such locations. Operations within the queue are characterized by stop-and-go waves, and they are extremely unstable. Vehicles may progress at reasonable speeds for several hundred feet or more, then be required to stop in a cyclic fashion. Level-of-service F is used to describe the operating conditions within the queue, as well as the point of the breakdown. In many cases, operating conditions of vehicles or pedestrians discharged from the queue may be quite good. It is the point at which arrival flow exceeds discharge flow which causes the queue to form. Level-of-service F is an appropriate designation for such points.

Traffic Safety

Traffic accident records are useful in locating problem areas on the highway system. However, a study of traffic accidents that occurred within 200 feet of intersections in the planning area showed that there are no locations where an excessive number of accidents occur.

Bridge Conditions

Bridges are a vital and unique element of a highway system. First, they represent the highest unit investment of all elements of the system. Second, any inadequacy or deficiency in a bridge reduces the value of the total transportation system. Third, a bridge presents the greatest opportunity of all potential highway failures for disruption of community welfare. Finally, and most importantly, a bridge represents the greatest opportunity of all highway failures for loss of life. Therefore, it is imperative that bridges be constructed to the same, or higher, design standards as the system of which they are a part.

Congress enacted the National Bridge Inspection Standards on April 27, 1971, implementing the Federal Aid Highway Act of 1968. The Standards require that all structures defined as bridges located on any of the Federal-Aid Highway Systems be inspected and that the safe load carrying capacity be computed at regular intervals, not to exceed two years. A sufficiency index number has been calculated for each bridge for the purpose of establishing eligibility and priority for replacement. The bridges with the highest priorities are replaced as Federal-Aid Funds and State funds become available.

The North Carolina Bridge Maintenance Unit has been assisted by consultants in inspecting all bridges on the State Highway System. All bridges in the planning area have been analyzed, rated, appraised, inventoried, and the resulting data has been reduced to a more readily useable form as a management tool.

A sufficiency rating is used in the analysis to help determine if a particular bridge is below standards. The sufficiency rating is a method of evaluating factors which are indicative of a bridge's ability to remain in service. Factors include structural adequacy and safety, serviceability and functional obsolescence, essentiality for public use, type structure, and traffic safety features. The result of this method is a percentage in which 100 percent would represent an entirely sufficient bridge and zero percent would represent an entirely insufficient bridge. A sufficiency rating of 50 or less qualifies for Federal Bridge Replacement funds.

Substandard bridges can be further classified into two categories: structurally deficient and functionally obsolete. Structurally deficient bridges are in relatively poor condition or have insufficient load carrying capacity. Functionally obsolete bridges are narrow, have inadequate underclearance, have insufficient load carrying capacity, or are poorly aligned with the roadway and can no longer adequately serve today's traffic.

One bridge in the planning area is deficient and is scheduled for replacement (TIP B-2624). It is bridge #313 which carries SR 1190 across the Rocky Broad River a few hundred feet from US 64-74/NC 9. The bridge has a sufficiency rating of 25.9 out of a possible 100. Three other bridges in the planning area have sufficiency ratings less than 50. **Table 2** includes the substandard bridges and their ratings. The substandard bridge locations are shown in **figure 5.**

TABLE 2

SUBSTANDARD BRIDGES IN LAKE LURE/CHIMNEY ROCK		
BRIDGE NO.	ROUTE CARRIED	SUFFICIENCY RATING
7	US 64	43.6
52	US 64	42.3
313	SR 1190	25.9
569	SR 1314	48.8

SUBSTANDARD BRIDGES

SUFFICIENCY RATING < 50

LAKE LURE

RUTHERFORD COUNTY
NORTH CAROLINA
PREPARED BY THE
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS-STATEWIDE PLANNING BRANCH
IN COOPERATION WITH
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

FIGURE 5

4) The entrance to Chimney Rock Park currently maintains an admissions gate next to the highway. Vehicles waiting to enter the gate frequently back up into the highway and stop traffic. The park could alleviate this problem by moving the gate further south into the park.

It is recommended that if the Towns consider implementing any of these solutions that they consult their Division Traffic Engineer and the Municipal Traffic Engineering Assistance Program. They can be contacted at the following addresses and phone numbers:

Division 13 Traffic Engineer
PO Box 3279
Asheville, NC 28802
(704) 251-6171

Municipal Traffic Engineering Assistance Program
Traffic Engineering Branch
PO Box 25201
Raleigh, NC 27611
(919) 733-3915

V. PARKING CONDITIONS

There are a significant number of parking spaces along the segment of US 64/74 - NC 9 through Lake Lure and Chimney Rock. In Lake Lure, parallel parking spaces line the north side of the highway adjacent to the beach. The number of spaces is inadequate to meet the summer parking demand. In addition, the highway traffic flow is interrupted and delayed by vehicles entering and exiting these spaces.

Small shops, restaurants and hotels line the highway inside the Chimney Rock city limits. Each of these businesses maintains a small number of either angle or perpendicular parking spaces as part of their property. All of the spaces are immediately adjacent to the highway. During the peak tourist months, the demand exceeds the number of spaces and traffic tie-ups are caused by drivers entering, exiting, and searching for the limited spaces.

If common parking lots could be provided to serve large areas as opposed to single businesses, then the roadside parking spaces could be eliminated. This would increase the level of service on the highway. However, a system of sidewalks and safe pedestrian crossings would also be required so that visitors could park their vehicles and visit the local attractions by walking.

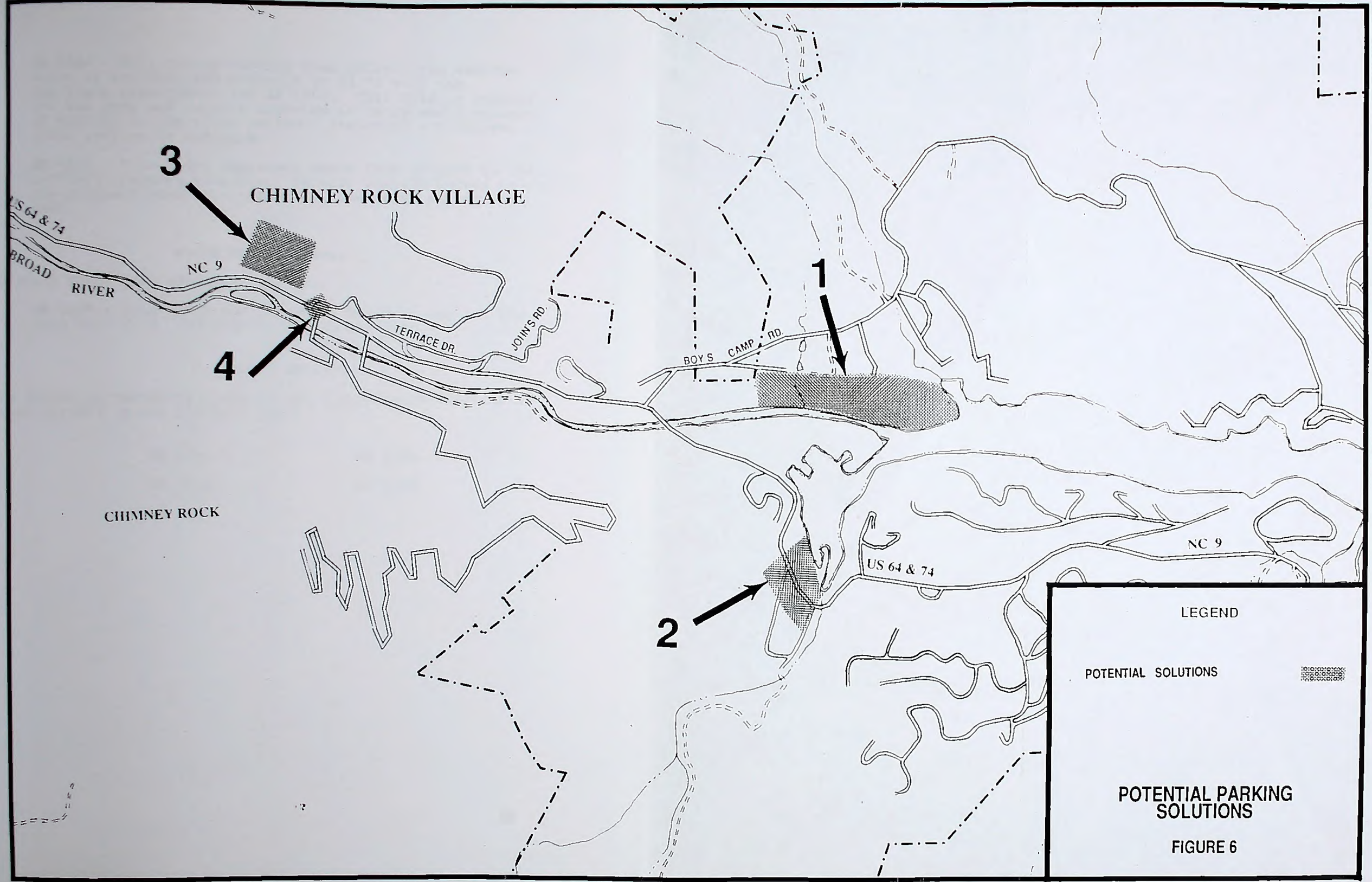
In meetings with the Lake Lure/Chimney Rock Transportation Committee, several sites were identified as potential parking lots. All sites and corresponding pedestrian access would have to be developed and implemented by the Towns and the Chimney Rock Park. These sites are described below with a preceding number that corresponds to **Figure 6**.

Potential Parking Sites

1) This large area next to the Police Station could serve the visitors to the beach and eliminate the need for the existing parallel parking. This area is accessible by a boardwalk that leads to the beach.

2) This site is contingent on the construction of the recommended highway realignment south of the shopping center (see **Figure 7**). Once the realignment is completed, the location of the old pavement between the shops and beach could be converted into a pedestrian/parking area.

3) This paved area was once the base for a chairlift on the mountain side. It could serve the businesses in Chimney Rock if safe pedestrian access is provided.


3
CHIMNEY ROCK VILLAGE
US 64 & 74
NC 9
BROAD RIVER
4
TERRACE DR.
JOHN'S RD.
BOY S CAMP RD.
1
CHIMNEY ROCK
2
US 64 & 74
NC 9
LEGEND
POTENTIAL SOLUTIONS
POTENTIAL PARKING SOLUTIONS
FIGURE 6

SR 1306 - This narrow winding road follows the eastern shore of the Lake and connects US 64/74 with the Fairfield Development and SR 1008. This road is typical for the area and is only expected to carry small volumes of traffic in the study period. Therefore its current cross section is adequate.

SR 1314 - This route continues north from SR 1306 to the northern planning boundary. It will provide access to the proposed western connector at the north end of the Lake.

Minor Thoroughfares

Existing minor thoroughfares include:

SR 1185 - This minor road connects US 64/74 east of the Lake with NC 9. No changes are recommended.

Local Streets

The following secondary roads on the State system function as local streets in the planning area:

SR 1301

SR 1302

SR 1303

SR 1304

SR 1190

VI. THOROUGHFARE PLAN

A brief discussion of the classified roads in the Lake Lure/Chimney Rock planning area is included in the following section. The recommended improvements to the Lake Lure road network are is shown in **Figure 7**. Specific details on physical and operational characteristics are given in **Appendix A Table 5**.

Major Thoroughfares

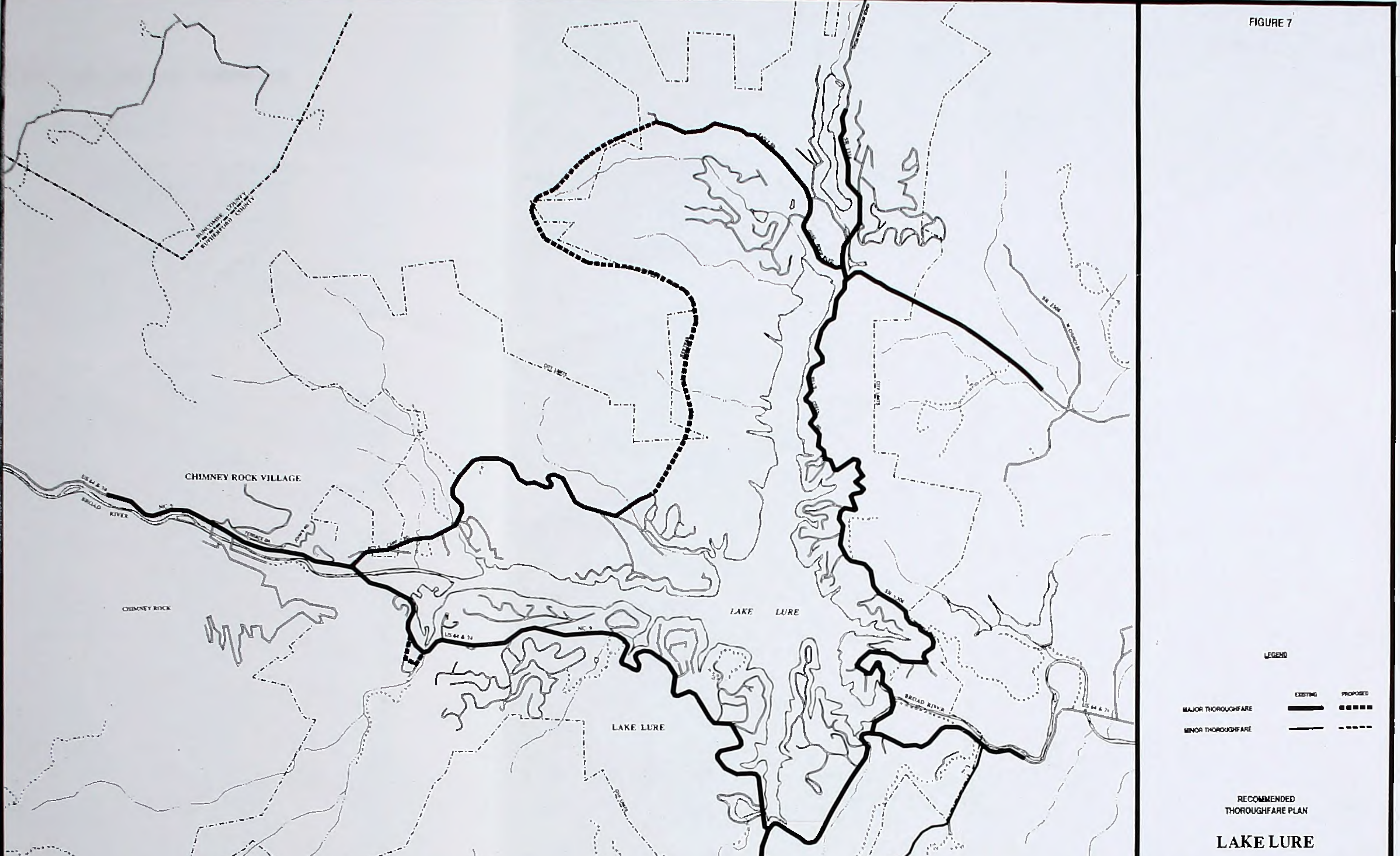
Existing major thoroughfares include:

US 64/74 & NC 9 - This highway is the major carrier of all traffic travelling both within and through the planning area. During the tourist season this route is badly congested from just east of Lake Lure's beach to the west end of Chimney Rock. Realignment of this road south of the beach area (see **Figure 7**) should help alleviate this congestion. This proposed improvement will eliminate the conflict between pedestrians walking from the beach to the shopping center and automobile traffic. It will also provide a large area for parking. The new alignment of US 74 (TIP R-99) which is already under construction and bypasses the planning area will decrease through traffic.

NC 9 (US 64/74 to south planning area boundary) - This route runs concurrently with US 64/74 from the west boundary of the planning area through both Towns and then splits off to the south. It allows traffic to flow between US 64/74 and the southern planning boundary. Its existing width should be sufficient to handle projected traffic volumes through the design year.

Western Connector - This proposed thoroughfare would be constructed by improving an existing jeep trail on the west side of the Lake. It will connect Eagle Road in the Fairfield development with existing Boy's Camp Road. It is proposed primarily to allow better service for emergency vehicles and to serve small volumes of local traffic. Due to its low projected volumes, this facility is recommended to meet minimum design standards and remain consistent with the other roads in this mountainous planning area. It should be constructed to a minimum cross section of 18 feet with maximum grades of 6%. The Western Connector will not carry significant tourist traffic but will allow residents to avoid congested sections of US 64/74 during the tourist season.

FIGURE 7



RECOMMENDED
THOROUGHFARE PLAN

LAKE LURE
AND
CHIMNEY ROCK VILLAGE

RUTHERFORD COUNTY
NORTH CAROLINA

PREPARED BY THE
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS-STATEWIDE PLANNING BRANCH
IN COOPERATION WITH
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

JANUARY 1992

VII. ENVIRONMENTAL CONCERNS AND PROJECT BENEFITS

Environmental Concerns

Evaluation of the environmental impacts of a project is one of the more difficult tasks. Environmental factors usually considered in highway project evaluation can be divided into three categories -- physical, social and/or cultural, and economic. Factors from all of these categories are utilized in the benefits analysis. The relative environmental impact of a project is measured by summing the positive and negative impacts. The primary environmental factors considered in the project evaluation are shown in **Table 3.**

TABLE 3

Environmental Considerations		
Physical Environment	**Social and/or Cultural Environment**	**Economic Environment**
Air Quality	Housing	Businesses
Water Resources	Neighborhoods	Employment
Wildlife	Noise	Economic Development
Vegetation	Education Facilities	Public Utilities
	Churches	Transportation Costs
	Park and Recreational Facilities	Capital Costs
	Public Health and Safety	Operation and Maintenance Costs
	National Defense	
	Aesthetics	

Benefits Analysis

The Lake Lure-Chimney Rock thoroughfare plan consists of two projects; the realignment of US 64 at the Lake Lure beach, and the improvement of the jeep trail around the west side of the lake (Western Connector). The projects were not evaluated on a dollar benefits basis because their purpose is to improve safety and convenience rather than to carry large volumes of traffic. The projects were, however, analyzed on their probability of providing an economic benefit and their environmental impact (see **TABLE 4**).

The realignment of US 64 is a minor change (less than 500 feet from its original location). It has two purposes; **1)** to eliminate the conflict between traffic and pedestrians by the beach and **2)** to provide more parking.

The Western Connector is designed primarily to increase emergency vehicle access around the Lake. It will also provide an alternate travelway around the Lake for local residents but it will not serve through traffic. Therefore, traffic volumes on this road will be relatively small.

TABLE 4

Project	Length Mile	Econ. Benefit	Environ. Impact
US 64 Realignment	0.32	+ 0.3	+ 0.3 - 0.0
Western Connector	1.66	+ 0.2	+ 0.2 - 0.1

VIII. IMPLEMENTATION

There are several methods through which a local government may implement a Thoroughfare Plan. They are as follows:

State-Municipal Adoption of the Thoroughfare Plan

The Town of Lake Lure and the North Carolina Department of Transportation have responsibility for implementation of the Lake Lure Thoroughfare Plan. Chapter 136, Article 3A, Section 136-66.2 of the North Carolina General Statutes provides that after development of a thoroughfare plan, the plan may be adopted by the governing body of the municipality and the Board of Transportation as the basis for future street and highway improvements. After mutual adoption, negotiations will begin to determine which of the existing and proposed thoroughfares will be a Department of Transportation responsibility and which will be a municipal responsibility. Facilities which are designated as State responsibility will be constructed and maintained by the Division of Highways; however, the municipality may share in the right-of-way cost. This share of costs will be determined at the time of construction.

In general, the State is responsible for those facilities which will be serving major volumes of through traffic and traffic from outside the area to major commercial, industrial, and institutional areas inside the municipality. Those facilities which will serve primarily internal traffic are to be a municipal responsibility.

After adoption of the thoroughfare plan, a municipality has the legal authority provided by the General Statutes of North Carolina to protect existing and proposed highway corridors through subdivision regulations and future street-line ordinances.

Subdivision Controls

Subdivision regulations require every subdivider to submit to the local planning commission a plan of his proposed subdivision and requires that the subdivision be constructed to certain standards. Through this process, it is possible to require the subdivision streets to conform to the Thoroughfare Plan and to reserve or protect necessary rights-of-way for projected roads and highways that are to become a part of the Thoroughfare Plan. The construction of subdivision streets to adequate standards would reduce maintenance costs and would facilitate the transfer of the streets to the State Highway System. **Appendix B** outlines the recommended design standards.

Roadway Corridor Official Map

North Carolina General Statutes 136-44.50 through 133-44.53 are collectively designated as the "Roadway Corridor Official Map Act." For cities contemplating the adoption of a Roadway Corridor Map, more commonly referred to as an official street map, there several things to consider prior to implementation. First and foremost, it should be recognized that an official street map places severe, but temporary, restrictions on private property rights. These restrictions are in the form of a prohibition, for a period of up to three years, for the issuance of building permits or subdivision of property lying within an official street map corridor. This authority should be used carefully and only in cases where less restrictive powers will be ineffective.

The Statute establishing the Official Street Map authority is fairly explicit in outlining the procedures to be followed and the types of projects to be considered. As required by the Statute, a project being considered for an Official Street Map must be programed in the State's Transportation Improvement Program (TIP) **or** included in a locally adopted capital improvement plan, in addition to appearing on the adopted street system plan. The Statute states that the capital improvement plan must be for a period of ten years or less, and must identify the estimated cost of acquisition and construction of the proposed project as well as the anticipated financing.

The Program and Policy Branch of the North Carolina Department of Transportation is responsible for facilitating the adoption of Official Street Maps. Cities considering Official Street Map projects should contact this Branch for their "Guidelines for Municipalities Considering Adoption of Roadway Corridor Maps" at:

Programming and Policy Branch
NC Department of Transportation
P.O. Box 25201
Raleigh, NC 27611

Zoning

A zoning ordinance can be beneficial to thoroughfare planning in that planned locations of various land uses and planned densities of dwellings can be realized. This provides a degree of stability on which to make future traffic projections and to plan streets and highways.

Other benefits of a good zoning ordinance are: **(1)** the establishment of standards of development which will aid traffic operations on major thoroughfares, and **(2)** minimizing strip commercial development which creates traffic friction and increases the traffic accident potential.

Urban Renewal

Urban renewal is defined as the rehabilitation of downtown areas by demolishing, remodeling, or repairing existing structures in accordance with comprehensive plans. This process allows for corrections to basic problems in the street system layout and design.

To qualify for community development funds or discretionary funds for urban renewal, a city must first prepare a community development program. Urban areas compete throughout the State on the bases of demographic points which consider such conditions as percent of substandard housing, people per square feet of housing, dwelling unit age, etc.

An effort can be made to ensure that community development and transportation plans are compatible.

Capital Improvements Program

One of the tools which makes it easier to build a planned thoroughfare system is a capital improvements program. This is a long range plan for the spending of money on street improvements, acquisition of right-of-way, and other capital improvements within the bounds of projected revenues. Municipal funds should be available for construction of street improvements which are a municipal responsibility, right-of-way cost sharing on facilities designated as Division of Highways responsibility, and advance purchase of right-of-way where such action is required.

The section of the capital improvements program which deals with the thoroughfare plan requires a fairly detailed knowledge of the costs of various projects. This program could be used to benefit any of the improvements listed in this plan.

Development Reviews

Driveway access to a State-maintained street or highway is reviewed by the District Engineer's office and by the Traffic Engineering Branch of the North Carolina Department of Transportation prior to access being allowed. Any development expected to generate large volumes (i.e. shopping centers, fast food restaurants, large industries, etc.) may be comprehensively studied by staff from the Traffic Engineering, Planning and Research, and Roadway Design Branches of NC DOT. If done at an early stage, it is often possible to significantly improve the development's accessibility at minimal expense. Since the municipality is the first point of contact for developers, it is important that the municipality advise them of this review requirement and cooperate in the review process.

Other Funding Sources

1. Assess user impact fees to fund transportation projects. These fees, called "facility fees" in the legislation, are to be based upon "reasonable and uniform considerations of capital costs to be incurred by the town as a result of new construction. The facility fee must bear a direct relationship to additional or expanded public capital costs of the community service facilities to be rendered for the inhabitants, occupants of the new construction, or those associated with the development process."

2. Enact a bond issue to fund street improvements.

3. Continue to work with NCDOT to have local projects included in the Transportation Improvement Program(TIP).

4. Consider the possibility of specific projects qualifying for federal demonstration project funds.

5. Adopt a collector street plan that would assess buyer or property owners for street improvement.

6. Charge a special assessment for utilities; for example, increase water and sewer bills to cover cost of street improvements.

Implementation of Recommended Thoroughfare Plan

The best methods of implementation for the recommended realignment of US 64 and the proposed Western Connector are the following:

- Use the thoroughfare plan to get this project programed in the State's Transportation Improvement Program (TIP).

- Preserve the proposed corridor with a Roadway Corridor Official Map.

- Use local zoning to preserve the proposed corridor.

APPENDIX A

APPENDIX A

TYPICAL CROSS SECTIONS

Typical cross sections recommended by the Statewide Planning Branch are shown in the following diagrams of **Figure 8.**

Cross section "A" is illustrative for controlled access freeways. The 46 foot grassed median is the least desirable median width, but there could be some variation from this depending upon design considerations. Slopes of 8:1 into 3 foot drainage ditches are desirable for traffic safety. Right-of-way requirements would typically vary upward from 250 feet depending upon cut and fill requirements.

Cross section "B" is typical for four lane divided highways in rural areas which may have only partial or no control of access. The minimum median width for this cross section is 30 feet, but a wider median is desirable. Design requirements for slopes and drainage would be similar to cross section "A", but there may be some variation from this depending upon right-of-way constraints.

Cross section "C", seven lane urban, and cross section "D", five lane urban, are typical for major thoroughfares where frequent left turns are anticipated as a result of abutting development or frequent street intersections.

Cross sections "E" and "F" are used on major thoroughfares where left turns are anticipated as a result of abutting development or frequent street intersections.

Cross section "G" is recommended for urban boulevards or parkways to enhance the urban environment and to improve the compatibility of major thoroughfares with residential areas. A minimum median width of 24 feet is recommended with 30 feet being desirable.

Typical cross section "H" is recommended for major thoroughfares where projected travel indicates a need for four travel lanes but traffic is not excessively high, left turning movements are light, and right-of-way is restricted. An additional left turn lane would probably be required at major intersections.

Thoroughfares which are proposed to function as one-way traffic carriers would typically require cross section "I". Cross section "J" and "K" are usually recommended for minor thoroughfares since these facilities usually serve both land service and traffic service functions. Cross section "J" would be used on those minor thoroughfares were parking on both sides is needed as a result of more concentrated development.

Cross section "L" is used in rural areas or for staged construction of a wider multi-lane cross section. On some thoroughfares projected traffic volumes may indicate that two travel lanes will adequately serve travel for a considerable period of time.

The curb and gutter urban cross sections all illustrate the sidewalk adjacent to the curb with a buffer or utility strip between the sidewalk an the minimum right-of-way line. This permits adequate setback for utility poles. If it is desired to move the sidewalk further away from the street to provide added separation for pedestrians or for aesthetic reasons, additional right-of-way must be provided to insure adequate setback for utility poles.

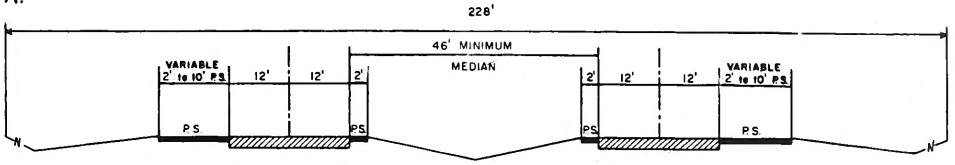
Right-of-way shown for the typical cross sections are the minimum rights-of-way required to contain the street, sidewalks, utilities, and drainage facilities. Cut and fill requirements may require either additional right-of-way or construction easements. Obtaining construction easements is becoming the more common practice for urban thoroughfare construction.

If there is sufficient bicycle facilities. The North Carolina Bicycle Facility and Program Handbook should be consulted for design standards for bicycle facilities.

Recommended typical cross sections for thoroughfares were derived on the basis of projected traffic, existing capacities, desirable levels of service, and available right-of-way.

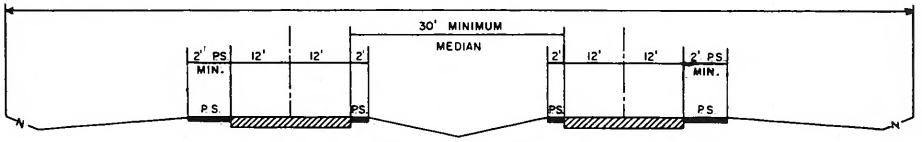
TYPICAL THOROUGHFARE CROSS SECTIONS

A.



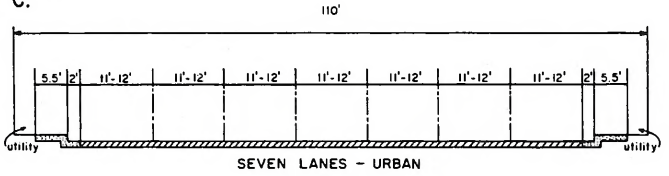
FOUR LANES DIVIDED WITH MEDIAN - FREEWAY

B.



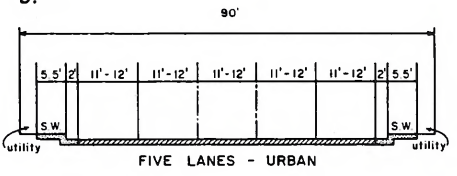
FOUR LANES DIVIDED WITH MEDIAN - RURAL

C.



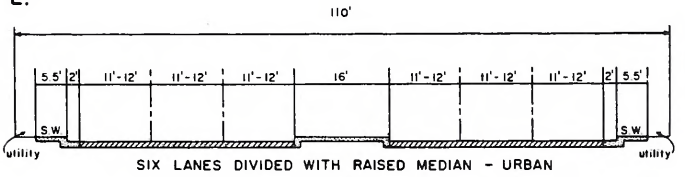
SEVEN LANES - URBAN

D.



FIVE LANES - URBAN

E.

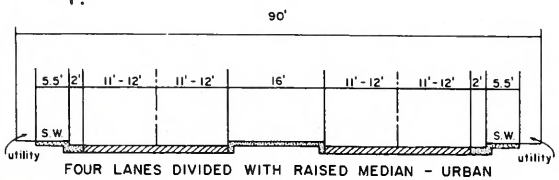


SIX LANES DIVIDED WITH RAISED MEDIAN - URBAN

FIGURE 8

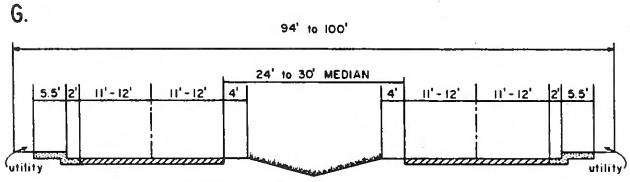
TYPICAL THOROUGHFARE CROSS SECTIONS
(CONTINUED)

F.



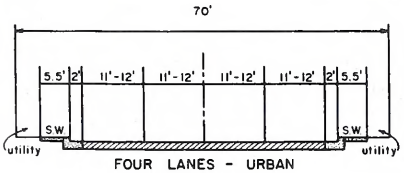
FOUR LANES DIVIDED WITH RAISED MEDIAN - URBAN

G.



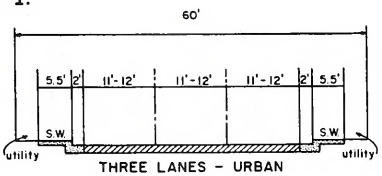
FOUR LANES DIVIDED - URBAN BOULEVARD
GRASS MEDIAN

H.



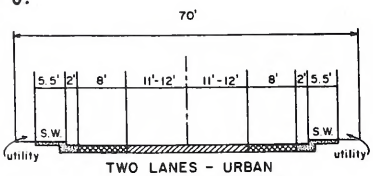
FOUR LANES - URBAN

I.



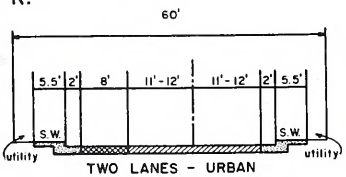
THREE LANES - URBAN

J.



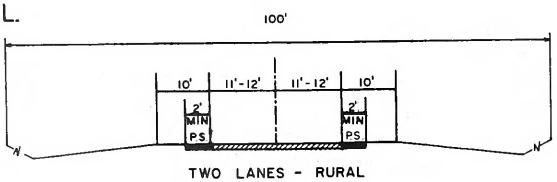
TWO LANES - URBAN
PARKING ON EACH SIDE

K.



TWO LANES - URBAN
PARKING ON ONE SIDE

L.



TWO LANES - RURAL

TABLE 5
THOROUGHFARE PLAN STREET TABULATION AND RECOMMENDATIONS

FACILITY & SECTION	EXISTING X - SECTION DIST MI	RDWY FT	ROW FT	CAPACITY CURRENT (FUTURE)	1989 ADTS	2020 ADTS	RECOMMENDED X - SECTION RDWAY (ULT)	ROW (ULT)
S 64/74								
County Line - MP 2.65	2.65	24	60	9000	3800	9200	NC	NC
MP 2.65 - MP 2.73	0.08	24		9000	3800	9200	NC	NC
MP 2.73 - MP 3.20	0.47	22		8500	3800	9200	NC	NC
MP 3.20 - MP 3.37	0.17	50		9000	3800	9200	NC	NC
MP 3.37 - Bridge	0.03	35		9000	3800	9200	NC	NC
Bridge - MP 3.68	0.28	30	60	9000	3800	9200	NC	NC
MP 3.68 - MP 4.05	0.37	30		(9000)	3800	9200	L	100
MP 4.05 - NC 9	3.11	22		8500	2900	7000	ADQ	ADQ
NC 9 - PAB	4.60	22		8500	2700	6600	ADQ	ADQ
C 9								
PAB - NC 64/74	0.95	20	60	8000	1300	3200	ADQ	ADQ
R 1306								
US 64/74 - MP 4.42	4.42	16		4500	300	750	ADQ	ADQ
MP 4.42 - ECL Lake Lure	0.50	18		5000	300	750	ADQ	ADQ
ECL Lake Lure - SR 1008	1.80	18		5000	300	750	ADQ	ADQ
estern Connector								
Eagle Rd - Boy's Camp Rd	2.84	Jeep Trail		(4000)	---	750	*	*
R 1308								
South Dead End - SR 1306	0.18	20		6000	50	150	ADQ	ADQ
SR 1306 - MP 0.44	0.26	20	60	6000	50	150	ADQ	ADQ
MP 0.44 - North Dead End	0.39	18	60	5000	50	150	ADQ	ADQ
R 1314								
NCL Lake Lure - MP 4.55	0.85	16		4500	50	150	ADQ	ADQ
MP 4.55 - MP 5.68	1.13	26		10000	90	225	ADQ	ADQ
MP 5.68 - MP 6.00	0.32	18	60	5000	100	250	ADQ	ADQ
MP 6.00 - SR 1306	0.20	18	60	5000	100	250	ADQ	ADQ
R 1185								
NC 9 - ECL Lake Lure	0.52	16		4500	50	150	ADQ	ADQ
ECL Lake Lure - US 64/74	1.50	15		4000	50	150	ADQ	ADQ

PAB - PLANNING AREA BOUNDARY **ADQ - ADEQUATE** **MP - MILE POST**
NC - NO CHANGE

* The Western Connector is projected to carry small volumes of local traffic. Therefore, its recommended cross section is 18 feet. (see pg. 29)

TABLE 5
THOROUGHFARE PLAN STREET TABULATION AND RECOMMENDATIONS

FACILITY & SECTION	EXISTING X - SECTION DIST MI	RDWY FT	ROW FT	CAPACITY CURRENT (FUTURE)	1989 ADTS	2020 ADTS	RECOMMENDED X - SECTION RDWAY (ULT)	ROW (ULT)
SR 1301								
US 64/74 - SR 1300	0.04	15		2500	50	100	ADQ	ADQ
SR 1302								
SR 1300 - Dead End	0.08	12		2000	50	100	ADQ	ADQ
SR 1303								
US 64/74 - Dead End	0.32	20		4000	50	100	ADQ	ADQ
SR 1304								
US 64/74 - Dead End	0.10	18		3500	50	100	ADQ	ADQ
SR 1190								
US 64/74 - Dead End	0.30	14		2500	100	150	ADQ	ADQ

PAB - PLANNING AREA BOUNDARY **ADQ - ADEQUATE** **MP - MILE POST**

NC - NO CHANGE

APPENDIX B

APPENDIX B

RECOMMENDED SUBDIVISION ORDINANCES

DEFINITIONS

I. Streets and Roads:

A. Rural Roads

1. Principal Arterial - A rural link in a highway system serving travel, and having characteristics indicative of substantial statewide or interstate travel and existing solely to serve traffic. This network would consist of Interstate routes and other routes designated as principal arterials.

2. Minor Arterial - A rural roadway joining cities and larger towns and providing intra-state and inter-county service at relatively high overall travel speeds with minimum interference to through movement.

3. Major Collector - A road which serves major intra-county travel corridors and traffic generators and provides access to the Arterial system.

4. Minor Collector - A road which provides service to small local communities and traffic generators and provides access to the Major Collector system.

5. Local Road - A road which serves primarily to provide access to adjacent land, over relatively short distances.

B. Urban Streets

1. Major Thoroughfares - Major thoroughfares consist of Interstate, other freeway, expressway, or parkway roads, and major streets that provide for the expeditious movement of high volumes of traffic within and through urban areas.

2. Minor Thoroughfares - Minor thoroughfares perform the function of collecting traffic from local access streets and carrying it to the major thoroughfare system. Minor thoroughfares may be used to supplement the major thoroughfare system by facilitating minor through-traffic movements and may also serve abutting property.

3. Local Street - A local street is any street not on a higher order urban system and serves primarily to provide direct access to abutting land.

C. Specific Type Rural or Urban Streets

1. Freeway, expressway, or parkway - Divided multilane roadways designed to carry large volumes of traffic at high speeds. A freeway provides for continuous flow of vehicles with no direct access to abutting property and with access to selected crossroads only by way of interchanges. An expressway is a facility with full or partial control of access and generally with grade separations at major intersections. A parkway is a for non-commercial traffic, with full of partial control or access.

2. Residential Collector Street - A local street which serves as a connector street between local residential streets and the thoroughfare system. Residential collector streets typically collect traffic from 100 to 400 dwelling units.

3. Local Residential Street - Cul-de-sacs, loop streets less than 2,500 feet in length, or streets less than one mile in length that do not connect thoroughfares, or serve major traffic generators, and do not collect traffic from more than 100 dwelling units.

4. Cul-de-sac - A short street having only one end open to traffic and the other end being permanently terminated and a vehicular turn-around provided.

5. Frontage Road - A road that is parallel to a partial or full access controlled facility and provides access to adjacent land.

6. Alley - A strip of land, owned publicly or privately, set aside primarily for vehicular service access to the back side of properties otherwise abutting on a street.

II. Property

A. Building Setback Line - A line parallel to the street in front of which no structure shall be erected.

B. Easement - A grant by the property owner for use by the public, a corporation, or person(s), of a strip of land for a specific purpose.

C. Lot - A portion of a subdivision, or any other parcel of land, which is intended as a unit for transfer of ownership or for development or both. The word "lot" includes the words "plat" and "parcel".

III. Subdivision

A. Subdivider - Any person, firm, corporation or official agent thereof, who subdivides of develops any land deemed to be a subdivision.

B. Subdivision - All divisions of a tract or parcel of land into two or more lots, building sites, or other divisions for the purpose, immediate or future, of sale or building development and all divisions of land involving the dedication of a new street or change in existing streets; provided, however, that the following shall not be included within this definition nor subject to these regulations: (1) the combination or recombination of portions of previously platted lots where the total number of lots is not increased and the resultant lots are equal to or exceed the standards contained herein; (2) the division of land into parcels greater than ten acres where no street right-of-way dedication is involved, (3) widening of opening of streets; (4) the division of a tract in single ownership whose entire area is no greater than two acres into not more than three lots, where no street right-of-way dedication is involved and where the resultant lots are equal to or exceed the standards contained herein.

C. Dedication - A gift, by the owner, of his property to another party without any consideration being given for the transfer. The dedication is made by written instrument and is completed with an acceptance.

D. Reservation - Reservation of land does not involve any transfer of property rights. It constitutes an obligation to keep property free from development for a stated period of time.

DESIGN STANDARDS

I. Streets and Roads

The design of all roads within Plymouth shall be in accordance with the accepted policies of the North Carolina Department of Transportation, Division of Highways, as taken or modified from the American Association of State Highway Officials' (AASHTO) manuals.

The provision of street rights-of-way shall conform and meet the recommendations of the Thoroughfare Plan, as adopted by the Town of Plymouth.

The proposed street layout shall be coordinated with the existing street system of the surrounding area. Normally the proposed streets should be the extension of existing streets if possible.

A. Right-of-way Widths - Right-of-way (ROW) widths shall not be less than the following and shall apply except in those cases where ROW requirements have been specifically set out the Thoroughfare Plan.

		Min. ROW
1.	Rural	
	a. Principle Arterial	
	Freeways	350 ft.
	Other	200 ft.
	b. Minor Arterial	100 ft.
	c. Major Collector	100 ft.
	d. Minor Collector	80 ft.
	e. Local Road	60 ft.[1]
2.	Urban	
	a. Major Thoroughfare other than Freeway and Expressway	90 ft.
	b. Minor Thoroughfare	70 ft.
	c. Local Street	60 ft.[1]
	d. Cul-de-sac	Variable[2]

The subdivider will only be required to dedicate a maximum of 100 feet of right-of-way. In cases where over 100 feet of right-of-way is desired, the subdivider will be required only to reserve the amount in excess of 100 feet. On all cases in which right-of-way is sought for a fully controlled access facility, the subdivider will only be required to make a reservation. It is strongly recommended that subdivisions provide access to properties from internal streets, and that direct property access to major thoroughfares, principle and minor arterials, and major collectors be avoided. Direct property access to minor thoroughfares is also undesirable.

A partial width right-of-way, not less than sixty feet in width, may be dedicated when adjoining undeveloped property that is owned or controlled by the subdivider; provided that the width of a partial dedication be such as to permit the installation of such facilities as may be necessary to serve abutting lots. When the said adjoining property is subdivided, the remainder of the full required right-of-way shall be dedicated.

B. Street Widths - Widths for street and road classifications other than local shall be as recommended by the Thoroughfare Plan. Width of local roads and streets shall be as follows:

---

[1] The desirable minimum right-of-way (ROW) is 60 ft. If curb and gutter is provided, 50 feet of ROW is adequate on local residential streets.

[2] The ROW dimension will depend on radius used for vehicular turnaround. Distance from edge of pavement of turnaround to ROW should not be less than distance from edge of pavement to ROW on street approaching turnaround.

1. Local Residential
   Curb and Gutter section: 26 feet, face to face of curb
   Shoulder section: 20 feet to edge of pavement, 4 foot shoulders

2. Residential Collector
   Curb and Gutter section: 34 feet, face to face of curb
   Shoulder section: 20 feet to edge of pavement, 6 foot shoulders

C. Geometric Characteristics - The standards outlined below shall apply to all subdivision streets proposed for addition to the State Highway System or Municipal Street System. In cases where a subdivision is sought adjacent to a proposed thoroughfare corridor, the requirements of dedication and reservation discussed under Right-of-Way shall apply.

1. Design Speed - The design speed for a roadway should be a minimum of 5 mph greater than the posted speed limit. The design speeds for subdivision type streets shall be:

DESIGN SPEEDS

Facility Type	Design Speed		
	Desirable	Minimum	
		Level	Rolling
RURAL			
Minor Collector Roads	60	50	40
Local roads including Residential Collectors and Local Residential	50	50	40
URBAN			
Major Thoroughfares other than Freeway or Expressway	60	50	50
Minor Thoroughfares	60	50	40
Local Streets	40	40	30

2. Maximum and Minimum Grades

a. The maximum grades in percent shall be:

MAXIMUM VERTICAL GRADE		
Design Speed	Terrain Level	Rolling
60	4	5
50	5	6
40	6	7
30		9

b. Minimum grade should not be less than 0.5% .

c. Grades for 100 feet each way from intersections (measured from edge of pavement) should not exceed 5%.

d. For streets and roads with projected annual average daily traffic less than 250, short grades less than 500 feet long, may be 150% of the value in the above table.

3. Minimum Sight Distance - In the interest of public safety, no less than the minimum sight distance applicable shall be provided. Vertical curves that connect each change in grade shall be provided and calculated using the following parameters:

SIGHT DISTANCE				
Design Speed	30	40	50	60
Stopping Sight Distance				
Minimum (ft.)	200	275	400	525
Desirable Minimum (ft.)	200	325	475	650
Minimum K Value for:				
Crest curve	30	80	160	310
Sag curve	40	70	110	160

(General practice calls for vertical curves to be multiples of 50 feet. Calculated lengths shall be rounded up in each case.)

* K is a coefficient by which the algebraic difference in grade may be multiplied to determine the length in feet of the vertical curve which will provide the desired sight distance.

Sight distance provided for stopped vehicles at intersections should be in accordance with "A Policy on Geometric Design of Highways and Streets, 1984".

4. The "Superelevation Table" below shows the maximum degree of curve and related maximum superelevation for design speeds. The maximum rate of roadway superelevation (e) for rural roads with no curb and gutter of 0.08. The maximum rate of superelevation for urban streets with curb and gutter is 0.06, with 0.04 being desirable.

SUPERELEVATION TABLE			
Design Speed	Maximum e	Minimum Radius ft.	Max. Deg. of Curve.
30	0.04	302	19 00′
40	0.04	573	10 00′
50	0.04	955	6 00′
60	0.04	1,528	3 45′
30	0.06	273	21 00′
40	0.06	509	11 15′
50	0.06	849	6 45′
60	0.06	1,380	4 15′
30	0.08	252	22 45′
40	0.08	468	12 15′
50	0.08	764	7 30′
60	0.08	1,206	4 45′

e = rate of roadway superelevation, foot per foot

D. Intersections

1. Streets shall be laid out so as to intersect as nearly as possible at right angles, and no street should intersect any other street at an angle less than sixty-five (65) degrees.

2. Property lines at intersections should be set so that the distance from the edge of pavement, of the street turnout, to the property line will be at least as great as the distance from the edge of pavement to the property line along the intersecting streets. This property line can be established as a radius or as a sight triangle. Greater offsets from the edge of pavement to the property lines will be required, if necessary, to provide sight distance for the stopped vehicle on the side street.

3. Off-set intersections are to be avoided. Intersections which cannot be aligned should be separated by a minimum length of 200 feet between survey centerlines.

E. Cul-de-sacs

Cul-de-sacs shall not be more than five hundred (500) feet in length. the distance from the edge of pavement on the vehicular turnaround to the right-of-way line should not be less than the distance from the edge of pavement to right-of-way line on the street approaching the turnaround. Cul-de-sacs should not be used to avoid connection with an existing street or to avoid the extension of an important street.

F. Alleys

1. Alleys shall be required to serve lots used for commercial and industrial purposes except that this requirement may be waived where other definite and assured provision is make for service access. Alleys shall not be provided in residential subdivisions unless necessitated by unusual circumstances.

2. The width of an alley shall be at least twenty (20) feet.

3. Deadend alleys shall be avoided where possible, but if unavoidable, shall be provided with adequate turnaround facilities at the deadend as may be required by the Planning Board.

G. Permits For Connection To State Roads

An approved permit is required for connection to any existing state system road. This permit is required prior to any construction on the street or road. The application is available at the office of the District Engineer of the Division of Highways.

H. Offsets To Utility Poles

Poles for overhead utilities should be located clear of roadway shoulders, preferably a minimum of at least 30 feet from the edge of pavement. On streets with curb and gutter, utility poles shall be set back a minimum distance of 6 feet from the face of curb.

I. Wheel Chair Ramps

All street curbs being constructed or reconstructed for maintenance purposes, traffic operations, repairs, correction of utilities, or altered for any reason, shall provide wheelchair ramps for the physically handicapped at intersections where both curb and gutter and sidewalks are provided and at other major points of pedestrian flow.

J. Horizontal Width on Bridge Deck

1. The clear roadway widths for new and reconstructed bridges serving 2 lane, 2 way traffic should be as follows:

   a. Shoulder section approach

      i. Under 800 ADT design year

         Minimum 28 feet width face to face of parapets of rails or pavement width plus 10 feet, whichever is greater.

      ii. 800 - 2000 ADT design year

         Minimum 34 feet width face to face of parapets of rails or pavement width plus 12 feet, whichever is greater.

      iii. Over 2000 ADT design year

         Minimum width of 40 feet, desirable width of 44 feet width face to face of parapets or rails.

   b. Curbs and gutter approach

      i. Under 800 ADT design year

         Minimum 24 feet face to face of curbs.

      ii. Over 800 ADT design year

         Width of approach pavement measured face to face of curbs.

         Where curb and gutter sections are used on roadway approaches, curbs on bridges shall match the curbs on approaches in height, in width of face to face of curbs, and in crown drop. The distance from face of curb to face of parapet or rail shall be 1'6" minimum, or greater if sidewalks are required.

2. The clear roadway widths for new and reconstructed bridges having 4 or more lanes serving undivided two-way traffic should be as follows:

   a. Shoulder section approach - Width of approach pavement plus width of usable shoulders on the approach left and right. (Shoulder width 8' minimum, 10' desirable.)

   b. Curb and gutter approach - Width of approach pavement measured face to face of curbs.